their hands the better for the progress of Assyriology. Another want is students to work at the Accadian, Sumerian, and Semitic inscriptions which are now available in abundance, and it is much to be hoped that Mr. King's book will induce young men of means and leisure to devote themselves to these most important subjects.

About thirty years ago, when the late Sir Henry Rawlinson and Mr. George Smith were working through the masses of inscribed clay fragments from the Royal Library at Nineveh, it was commonly thought that the originals of the early portions of Genesis would be found among them, and the identification of the Story of the Deluge which Mr. G. Smith published in 1870, greatly stimulated the hopes of the theologian and historian. As a result the most absurd expectations were formed, and for some years after this date, the study of cuneiform was cultivated by many solely with the view of discovering parallelisms and "proofs" of the Bible narrative. Attempts were made by Oppert, Schrader, Sayce, and others to formulate a grammar of the cuneiform inscriptions, and their works were instrumental in setting the subject on a firm base. Semitic scholars in general were somewhat sceptical, but that is hardly to be wondered at when we consider the colossal ignorance of general Semitic grammar which some of the early Assyrian "scholars" displayed in their publications. Since that time, however, the knowledge of the cuneiform inscriptions has increased greatly, and Mr. King's book is a proof of this fact; to some who have gone on crying persistently that Assyriology is "uncertain" and "nebulous" it will come as an unpleasant surprise. Roughly speaking, it may be divided into three parts: (1) Grammar; (2) cuneiform texts; and (3) vocabulary. In the first part Mr. King describes briefly the origin and rise of our cuneiform knowledge, and gives a tolerably full sketch of Assyrian grammar, with sign lists, lists of ideographs, &c. In the second part we have a series of forty-two complete extracts from cuneiform compositions of all periods from B.C. 2200 to B.C 600; these comprise historical, mythological, religious, magical, epistolary and other texts, including the Tell el-Amarna tablets. In the third part are a number of cuneiform texts, specially arranged to enable the beginner to test his own knowledge and to gain experience and confidence in deciphering new compositions, and a complete vocabulary to the whole book. From beginning to end cuneiform type is used, and as the fount is of the same size as that employed by the late Sir Henry Rawlinson, it will not be found troublesome to the eyes. The full transliterations and translations will materially help the beginner, and even the more advanced student will, at times, be glad of them; and, as far as we can see, Mr. King is abreast of all the modern readings and renderings adopted by American and German scholars. We notice that he follows those who read the name of the plague-god Ura, and has no doubt good reason for so doing; it seems, however, that Father Scheil has found the name spelt Dibbara, syllabically, which reading agrees with that suggested by Harper, Delitzsch and others.

It is to be hoped that Mr. King's book will attract new workers to the field of Assyriology, and that it will lead them eventually to the unravelling of the meanings of the difficult texts, which were written in the most complex of characters by Semitic and non-Semitic peoples alike at the dawn of civilisation.

THE NEBULAR HYPOTHESIS.

Essai synthétique sur la formation du Système Solaire; première partie: formation du système. Par M. le Général Lafouge. Pp. ix + 226. (Chalons sur Marne: Martin Frères, 1898.)

THE nebular hypothesis of the origin of the planetary system, presented by Laplace "avec la défiance que doit inspirer tout ce qui n'est point un résultat de l'observation ou du calcul," is now just over a century old. At the time of its conception weak points must have been apparent, probably to none more clearly than to Laplace himself, although the main points of his theory are displayed with a concise lucidity, which is unfortunately rarely to be found in the works of later writers on the same subject. And now, after years of criticism and counter suggestions prompted by speculations both rational and irrational, the hypothesis stands very much in its original position. Its inadequacy in some special directions has, it is true, become more fully realised as fresh facts have arisen to be explained. We are not concerned here in mentioning the particular directions in which the original hypothesis stands in need of support, further than to point out that the author has not given particular attention to these difficulties. Without entering into objections, which Lord Kelvin and others have raised from purely theoretical considerations, it will be sufficient to mention that the symmetry which is found to exist in the arrangement of the planetary system offers a difficulty to which no adequate answer has been found. No mathematical proof has yet been given, nor is it given in this book, to show that a ring of vapour surrounding the sun or central mass could condense into a single planet of considerable mass. The conditions supposed by Laplace seem more favourable to the formation of a swarm of small bodies more resembling the asteroids, or bodies of even lesser bulk, than that of a system of planets, encircled by satellites. Nor does the simple observation of nebulæ in the sky contribute any material support to the original theory. Those nebulæ whose construction can best be studied in the telescope do not present that regularity of outline or condensation, which would seem to be demanded by the construction of such regular mechanism as the solar system possesses. But the fundamental principle contained in Laplace is that the formation of the planetary system is the result of a process rather than of an act, and this suggestion remains practically undisputed. If the details and facts by which Laplace sought to maintain his hypothesis have received little confirmation since his time, it is still safe to say that his generic thought has not been refuted after a century of research. Indeed research has had little direct bearing on the subject, with the exception of two most remarkable investigations: the one, that of M. Poincaré on the possible forms of equilibrium of a rotating fluid mass; the other, the great work of Prof. G. H. Darwin on the effects of tidal action.

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Nevertheless, in spite of the really small increase of our knowledge in comparison with the great difficulty of the problem involved, there has been no lack of speculations, more or less scientific, on a subject which has evidently exercised a not unnatural fascination on many minds. The authors of these elaborations of the original theory, of whom M. Faye is perhaps the best known example, have all borrowed at least the central idea of Laplace, deriving the whole solar system from a single aggregation by some process of successive annulation. This is the course adopted by General Lafouge, who, however, is not content to start with a nebula endowed with sensible heat and angular momentum. He imagines the nebula to exist in its initial stage of an indefinite and irregular shape at a temperature of 0° on the absolute scale, and in this mass the attenuated constituents, dissociated by the cold, are perfectly intermixed. Such a process of dissociation is not in agreement with what is known of the properties of matter, and little can be said in favour of the assumption. The homogeneous material of the nebula is, in the author's hypothesis, subject to molecular cohesion, but not to internal attracting forces. Yet the nebula is under the attracting influence of external bodies from which are derived motions of translation and rotation, together with the formation of a central nucleus of increased relative density, while the whole body takes a spheroidal shape as it loses its homogeneity. The action of tides, which is here made use of, though rather vaguely described, is beyond all doubt an influence of the highest importance in the early history of the nascent system. But to attribute great dynamical effects to external attraction, while denying the evident result of mutual attractions of the several parts of the nebula itself, is, if we have correctly apprehended the author, an absurd inconsistency which makes us distrust the whole theory as here presented. And yet, while denying that internal gravitation is operative, General Lafouge supposes a molecular cohesion sufficient to cause the nebula to finally "tourner tout d'une pièce."

A dense central nucleus is now formed, as the author is careful to explain, by the attraction of exterior masses. No thermal effect arises from this operation, because no internal work is done; but the nucleus acts as a centre of attraction to which the outer parts are drawn. In this way heat is developed, and the angular velocity is increased by the contraction in volume, just as in the theory of Laplace. Dilation of the nucleus takes place as a consequence of the rise of temperature, and, assisted by the centrifugal force, a stratum of the nucleus rises until equilibrium is attained under the pressure of the materials descending from the outer regions. In this way a ring is formed, which is later to give birth to the first planet. Meanwhile more rings are formed in the same way, towards the outside of the nebula, the outside ring, and consequently the outside planet, being formed last, as in M. Faye's system. The nucleus, however, continues to be enlarged by additions from the outer material, and by the dilation caused by the heat disengaged, until finally it absorbs the rings to which it has given rise. Under new conditions of pressure the ring splits up into vortices, which gather up the scattered fragments of the ring and form an agglomeration, which remains as a planet, while the central mass, after absorbing all the residual matter of the original nebula, finally contracts as it loses heat by radiation. For the explanatory details of the actual conditions of the solar system, and for a theory of the origin of comets, space cannot be found here, and on these points the essay itself must be consulted.

Although the sources from which General Lafouge has gathered his ideas are not very frequently acknowledged, there seems to be reason to suppose that many of them are not original. Doubtless the plan of the author was to advance a theory which should commend itself as a reasoned whole, and therefore the origin of an idea seemed to him of little importance compared with its intrinsic merit. Thus the division of rings into multiple branches by means of currents from the polar regions seems suggested by an idea of M. Roche; little or no use is made of these multiple branches, however. On the subject of solar heat again, a view is advanced which seems a mere modification, without improvement, of the discredited theory of Sir W. Siemens. Originality and sound argument have not entered in large proportion into the composition of this essay, which, however, is probably not much worse and certainly not much better than many of its predecessors, elaborated with the same object in view. New facts acquired by the use of special apparatus may warrant or necessitate enlarged discussion of the theory of the origin of the cosmos; but to us it appears that science is not edified by these attempts to explain cosmogony by simply supplementing our very meagre knowledge of the operation of natural laws by a mass of conjectural hypotheses. Surely Laplace is right in saying: "Ces phénomènes et quelques autres semblablement expliqués, nous autorisent à penser que tous dépendent de ces loix, par des rapports plus ou moins cachés, qui doivent être le principal objet de nos recherches; mais dont il est plus sage d'avouer l'ignorance, que d'y substituer des causes imaginaires."

OUR BOOK SHELF.

Photographische Bibliothek, Nos. 9 and 10. *Das Fernobjektiv.* By Hans Schmidt. Pp. vi + 120. *Der Gummidruck.* By J. Gaedicke. Pp. vi + 79. (Berlin: Gustav Schmidt, 1898.)

IN the first of these two books Herr Hans Schmidt has brought together a good account of the manipulations necessary for the effective and successful working of the tele-photographic lens—the lens of the future, as he terms it in his preface. He divides his subject into four parts, the first two dealing with lenses generally, and the tele-photographic lenses, namely Steinheil's, Voigtländer's, and Zeiss's, in particular. In Part iii. he discusses their employment for obtaining pictures of different styles, such as architecture, portraits, landscapes, concluding in the fourth and last part with the practical work of setting up the apparatus, and the other manipulations previous to obtaining the finished picture.

Those who work with or intend to use lenses of this kind, cannot do better than consult this book, which is written by one who is familiar with their intricacies. Numerous reproductions from negatives, taken by the author himself, illustrate the several types of pictures which can be successfully obtained with these lenses.

In the second of these books the author, Herr J. Gaedicke, treats of the process, a form of direct pigment printing, that has proved so successful. Although the

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